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Pragmatic Pediatric Minimal invasive surgery

Ravichandran R[1], Srinivasan K[2], Rajamani G [3]
[1](GMK Medical College Hospital, Salem,India)
[2,3](Coimbatore Medical College Hospital ,Coimbatore,India)
Corresponding Author: Ravichandran R

Minimal Invasive surgery (MIS) in pediatric patients has been the standard of care which offers advantages for both patient and the surgeon. MIS offers greater benefits compared to open surgery such as greater surgical precision, reduced hospital stay, better surgical accessibility, decreased infection rate and smaller incision. The commonest MIS procedures performed are laparoscopy and thoracoscopy in various surgical disciplines. In pediatric patients the change over to MIS approach has resulted in lifelong consequences who undergo major operative procedure. In order to avoid collateral injuries the surgeons prefer to operate in the least invasive manner. This article emphasizes the current status of MIS in the pediatric practice at our institute. We also present the unique aspects of MIS in neonates and small children with benefits to the patient and the surprising challenges faced by the surgeons.
Here by we present our institutional experience of minimal invasive surgery in pediatric patients.

Keywords: *Minimally invasive surgery, laparoscopy, appendicectomy, thoracoscopy*

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I. Introduction

Paediatric surgeons were among the pioneers of laparoscopic surgery in the early 1970s, but the vast potential of this "minimally invasive" approach to treat children with surgical conditions has only recently gained momentum. [1]The earliest description of diagnostic laparoscopy was by Cortesi et al., (1976). However, diagnostic laparoscopy was introduced originally in 1910 by the Swedish physician – Hans Christian Jacobeus who published his results from diagnostic laparoscopy and thoracoscopic procedures (Badani et al., 2006). Therapeutic laparoscopy became popular following the description of laparoscopic appendicectomy by a German gynaecologist - Kurt Semm in 1983 (Semm, 1983) and of laparoscopic cholecysytectomy by the German surgeon – Erich Muhe in 1985 (Badani et al., 2006). Advancements in development of instrument components particularly illumination, optics, fiberoptic transmission, insufflation and video-apparatus have progressed alongside development of techniques for minimal access into the abdominal cavity. Development of paediatric laparoscopy was marked by Gans in his contribution to the development of paediatric miniature instruments in 1970 (Tantoco et al., 2005). Laparoscopy offers the surgeon the best option of achieving high standard surgical treatment while keeping tissue trauma to a minimum.

Pediatric surgeons operate on a variety of anatomical areas, including the abdomen, the chest, the head and neck, and the extremities [2-4]. Pediatric surgery has been probably the last truly general surgical specialty. It is a unique specialty because of the variability in patients' size and anatomical and physiological characteristics. Laparoscopic pediatric surgeons perform procedures in newborn babies to correct congenital anomalies such as diaphragmatic hernia, esophageal atresia, duodenal atresia and many others. At the other extreme, bariatric procedures are performed in morbidly obese adolescents. At present the Pediatric surgeons are well acquainted with state of the art technology like the use of robotic surgery in newborns and infants, the use of single incision surgery, single port laparoscopic surgery, and mini laparoscopy.

"Children are not miniaturized adults" , is true not only because of anatomical and physiological characteristics, but also because of psychological and emotional differences compared to the adult population.

An increasingly sophisticated and informed patient population often requests laparoscopy over open traditional procedures. Parents frequently select surgeons based on their laparoscopic skills.

The use of diagnostic, therapeutic laparoscopy has increased in the infant and neonatal population mainly with the development of 3mm and 2mm instruments . In the investigation of the neonate with abdominal distension, free gas on plain abdominal radiograph in the absence of corresponding clinical or physiological signs of peritonism, laparoscopy has been used to evaluate the condition and arrive at more focused specific management decisions with improved outcome.

Many procedures can be performed safely in children through small incisions. This has contributed to the reluctance of paediatric surgeons to embrace the laparoscopic approach. However, better access, panoramic

visual field, quick recovery and reduced complication rates still put laparoscopy ahead in these procedures. The physiological stress response to laparoscopic surgery is bare minimal when compared to open surgeries.

The relatively higher body surface/ mass ratio in infants means they have a delicate fluid balance which is easily stressed and put under pressure by evaporation of body fluids from exposure of abdominal contents at laparotomy. This is minimized by the laparoscopic approach and modification of laparoscopic equipment is on-going to further limit any drying effect the gas and light may exert on abdominal viscera.

Advances in paediatric anaesthetic monitoring and support equipment have also made a huge contribution. The result is an increasingly wider application to the use of laparoscopy in children. Jen and Shew (2010) observed an increase in the utilization of laparoscopy for the management of appendicitis in children from 18.6% in 1999 to 52.4% in 2006. Several diagnostic and therapeutic procedures have been demonstrated to be safely and efficiently undertaken with laparoscopy with several advantages over traditional methods of approach[5].

The anesthetists face the following challenges:

- Preoperative optimization of patients with co existing diseases (eg.pulmonary hypertension, gastrooesophageal reflux) and those posted for emergency surgery.
- Intraoperative diagnosis and treatment of effects of carbo peritoneum; maintenance of IAP between 6-12 mmHg. Vigilant observation of its effects and tailoring the management accordingly is the key to successful management.
- Monitoring ECG, NIBP, Pulse oximetry, Capnography, PNS and Temperature for the early detection of hypotension, bradycardia, arrythmias, venous air embolism, endobrochial intubation, pneumothorax and hypothermia is mandatory.

However, with effective optimization and prompt perioperative monitoring all these hurdles can be circumvented and the extreme benefits outweigh the preemptive blocks in children

II. Material And Methods

This retrospective study was carried out on patients of Department of Pediatric Surgery at GMK Medical College Hospital ,Salem and Coimbatore Medical College Hospital ,Coimbatore from November 2013 to November 2016. A total 250 (both male and females) of aged < 13years are in this study.

Study Design: Retrospective study

Study Location: This was a tertiary care teaching hospital based study done in Department of Pediatric Surgery, at GMK Medical College Hospital ,Salem and Coimbatore Medical College Hospital ,Coimbatore

Study Duration: November 2013 to November 2016.

Sample size: 200

Subjects & selection method: The study population were those who underwent minimally invasive surgery under age of 13years from November 2013 to November 2016.

Inclusion criteria:

Pediatric patients who underwent Laparoscopic procedures, thoracoscopic procedures.

Exclusion criteria:

Age >13years

Children who underwent open surgery in the study period and those who had MIS converted to open procedure.

Procedure methodology

The institutional ethical committee approval was taken before the commencing this study. The data pertaining to laparoscopic, thoracoscopic procedure were collected and presented to the committee for review and their approval sought. After the approval, we retrospectively reviewed the case files of children who were underwent laparoscopic and thoracoscopic procedures between November 2013 to November 2016. The review data included socio-demographic characteristics such as age, gender, presenting complaints, investigations, imaging reports, operative notes, complications, post-operative follow up. The written and informed consent in the local language was taken before any surgical intervention were carried out.

III. Result

The array of procedures performed include a wide range dealing system to system in specific dimensions. In our institute, minimally invasive surgeries are performed routinely. The below listed are the surgeries that we commonly perform in our institute.

Upper gastrointestinal tract
Ladd's procedure for intestinal malrotation
Pyloromyotomy
Reduction of intussusception
Intestinal duplication cyst
Adhesiolysis
Resection of Meckel's diverticulum
Lower gastrointestinal tract
Appendicectomy
Laparoscopy assisted anorectal pull through procedure (LAARP)
Pull through for Hirschsprung's disease
Solid Intra-abdominal organs
Splenectomy
Deroofing of splenic cyst
Abdominal cystic masses
Adrenal gland excision
Cholecystectomy
Gynecologic
Ovarian cystectomy
Ovarian detorsion
Oophorectomy
Diagnostic laparoscopy for chronic abdominal pain
Urology
Laparoscopy for impalpable testis
Fowler Stephen's stage 1 orchidopexy
Ligation of varicocele
Pyeloplasty
Heminephrectomy
Nephrectomy
We demonstrated that laparoscopic approach offered significant advantages with better outcomes than open approach in pediatric advanced appendicitis with less wound-related complications. The ability to give a thorough peritoneal lavage offers the advantage with lesser post-operative adhesions.

Our series on LAARP[6] with soaring numbers and minimal post-operative complications and effective postoperative continence has been widely appreciated. The procedure offers the advantage of placing the bowel within the muscle complex thus avoiding post-operative incontinence and avoiding neuronal injury.
Laparoscopic gubernaculum preserving orchiopexies have increased the testicular lifespan and the incidence of testicular atrophy is dramatically less. Further the chances of removing a nubbin testis if at all present at the opposite side also holds high.

Newer advancements in the field have evolved with retroperitoneoscopic surgeries being in vogue at a constant pace in our institute. Nephrectomies for non-functioning kidneys, adrenal lesions and heminephrectomies for infected duplex systems have achieved greater advantage of nullified paralytic ileus and rapid post-operative recovery as the absorption of carbon dioxide in very minimal.

Further in vogue are thoracoscopic surgeries where early empyema children are promptly managed with the decreased need for open thoracotomies. Further their morbidity with respect to hospital stay, ambulation and chest symptoms have drastically come down. It outweighs the probable complications with open thoracotomies done earlier.

IV. Discussion

The main advantages of laparoscopic surgery for patients are less postoperative pain, therefore minimizing use of postoperative analgesic dosages, reduced wound complications, minimal scarring, a shorter hospital stay, and an earlier return to normal activities including feeding, bowel movements and work/school.
Laparoscopic surgery in children is here to stay. However, doomsday predictions for the complete demise of open surgery are over exaggerated. The challenge ahead is to define more objectively the relative benefits of various laparoscopic and open techniques. Meanwhile, the potentials of endoscopic surgery should continue to be explored in appropriate settings—fetal endo-surgery is one exciting example.[8]

Meanwhile, the surgeon enjoys advantages in visualization and precision. A laparoscopic approach allows better visualization of obscure structures and areas, such as the lower esophageal sphincter complex and the small vagus nerves running along the esophageal muscle. Modern high-definition digital cameras and monitors dramatically magnify these small details, and angled telescopes allow views around corners simply

unavailable in open cases. When this visualization is combined with the meticulous precision possible to the well-practiced MIS surgeon who knows how to "move small," operations may be completed with similar or superior mechanical results as open cases. For example, authors have reported reductions in both case time and complications for pyloromyotomy, fundoplication, tracheo-esophageal hernia repair, duodenal-atresia repair, and other cases performed in infants [9,10]

Closely related to cost and precision is speed. Not only does longer operating times cost more in terms of operating room resources, but longer cases appear to increase the risk of complications. The picture for MIS and operating time is mixed. Early in any given surgeon's experience, operating times for laparoscopic cases can exceed the expected time for open procedures. The learning curve is well documented[11,12,13,14]; however, as surgeons become more facile, operating times can drop dramatically.

For example, laparoscopic pyloromyotomy takes less time than the standard procedure, sometimes far less, but with no "price" of increased complications. For these and other operations, speed follows from precision, not the reverse. Information Gain MIS offers surgeons new options for resolving clinical uncertainty because the cost to the patient is diminished, the power of exploration is greater than radiographic studies or other tests, or both.[15]For example, in malrotation, an upper gastrointestinal tract study may be nondiagnostic, but the stakes of missing malrotation are large, as volvulus, although rare, may be catastrophic. Laparoscopic exploration reliably diagnoses malrotation, can provide information that contrast studies cannot. Meanwhile, the laparoscopic Ladd procedure is at least as effective in preventing volvulus as the open Ladd operation.

V. Conclusion

The technical and technological aspects of pediatric MIS show that MIS is more than technique and technology; it is a choice. The hospital must choose to install the right equipment, bear higher instrument attrition costs, specially train the staff, and tolerate new learning curves. The surgeon must choose to add unfamiliar and uncomfortable methods to his repertoire.

He must also choose the patients for whom MIS can really reduce risks: there is a demonstrable gap between "can" and "should." Still, promised benefits are driving pediatric surgeon adoption as well as parental demand, and spurring innovations to overcome the challenges. Properly applied, MIS may offer better information, similar (or superior) mechanical results, more surgical options, shorter hospital stays, and lower costs, both in terms amount and risks to the pediatric patient.

References

[1]. Gans SL, Berci G. Advances in endoscopy of infants and children. J Pediatr Surg 1971; 6:199–233.
[2]. Sackier JM. Laparoscopy in pediatric surgery. J Pediatr Surg 1991;26:1145–7.
[3]. Miller SS. Laparoscopic operations in paediatric surgery. Br J Surg 1992;79:986–7.
[4]. Najmaldin A. Minimal access surgery in paediatrics. Arch Dis Child 1995;72:107–9.
[5]. Mattei P. Minimally invasive surgery in the diagnosis and treatment of abdominal pain in children. Curr Opin Pediatr 2007;19:338-43.
[6]. J Indian Assoc Pediatr Surg. 2017 Apr-Jun;22(2):114-118.
[7]. Laparoscopic-assisted Anorectoplasty: A Single-center Experience.
[8]. Gurusamy R[1], Raj SV[1], Maniam R[1], Regunandan SR[1].
[9]. Minerva Pediatr. 2015 Dec;67(6):525-8. Laparoscopy or retroperitoneoscopy for pediatric patients with adrenal masses? Esposito C[1], Giurin I, Iaquinto M, Escolino M, Salerno MC, De Filippo G, Savanelli A, Settimi A, Cigliano B.
[10]. Kimber C, Spitz L, Cuschieri A. Current state of antenatal in utero surgical interventions. *Arch Dis Child* 1997;**76**: 134–9.
[11]. Bax NM, Ure BM, van der Zee DC, van Tuijl I. Laparoscopic duodenoduodenostomy for duodenal atresia. Surg Endosc. 2001; 15(2):217 43.
[12]. Georgeson KE, Owings E. Advances in minimally invasive surgery in children. Am J Surg. 2000;180(5):362–364
[13]. Ford WD, Crameri JA, Holland AJ. The learning curve for laparoscopic pyloromyotomy. J Pediatr Surg. 1997;32(4): 552–554 60.
[14]. Fujimoto T, Lane GJ, Segawa O, Esaki S, Miyano T. Laparoscopic extramucosal pyloromyotomy versus open pyloromyotomy for infantile hypertrophic pyloric stenosis: which is better? J Pediatr Surg. 1999;34(2): 370–372 61.
[15]. Oak SN, Parelkar SV, Akhtar T, et al. Minimal access surgery in children—5 years institutional experience. J Minim Access Surg. 2005;1(3):121–128 62.
[16]. Oomen MW, Hoekstra LT, Bakx R, Heij HA. Learning curves for pediatric laparoscopy: how many operations are enough? The Amsterdam experience with laparoscopic pyloromyotomy. Surg Endosc. 2010; 24(8):1829–1833
[17]. Esposito C, Centonze A, Settimi A. The ef- ficacy of laparoscopy in detecting and treating associated congenital malformations in children. Surg Endosc. 2002;16(8): 1242

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